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The degree of implementation of the COSO 2013 internal control model and its effect on the profitability of non-SEC Mexican public companies

El grado de aplicación del modelo de control interno COSO 2013 y su efecto en la rentabilidad de las empresas públicas mexicanas no SEC

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Abstract

Although annual reports of companies listed in the US markets must reveal internal control framework being applied, in which COSO 2013 framework is the most used, Mexican regulations are not demanding a similar requirement and much less its level of adherence. For this reason, this research was defined to identify level of internal control perception by firms listed in the Mexican Stock Market and effects with the variables operating efficiency and profitability. A Likert Scale survey designed with COSO 2013 framework basis was applied to personnel from Accounting an Audit areas working for these companies. The operating efficiency and profitability effects were analyzed with financial reports from 2010 to 2020. The quantile regression method was used. The results indicate a significant impact of internal control perception with a negative coefficient, in which, a possible reason of this is the cost of implementing internal controls.

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Resumen

Aunque en los reportes anuales de empresas listadas en Estados Unidos es obligatorio revelar el modelo de control interno utilizado, siendo COSO 2013 el de mayor aplicación, en México no se cuenta con esta información y mucho menos, con su grado de aplicación. Por ello, el objetivo de esta investigación fue determinar la percepción en el nivel de aplicación de control interno en el mercado accionario de la Bolsa Mexicana de Valores y sus efectos en la eficiencia operativa y rentabilidad. Se aplicó una encuesta Likert basada en COSO 2013, a personal de áreas de contaduría y auditoría en empresas públicas. La eficiencia operativa y rentabilidad se midieron con datos de sus informes financieros 2010-2020. Se utilizó un modelo de regresión lineal cuantil. Los resultados indican que la percepción de control interno es significativa con un coeficiente negativo y una posible respuesta es la percepción que tuvieron los líderes de control interno sobre el costo de implementación.

Código JEL: M40
Palabras clave: control interno; COSO 2013; eficiencia operativa; rentabilidad

Introduction

The constant dynamism of business demands that companies implement efforts to achieve competitiveness and favorable results through the optimal use of their resources. As a basis for this, internal control has become a tool to achieve these objectives since it enables operations to be regulated and thus improves performance. This is established in the Theory of Management by Fayol (1916), which states that "to control is to see to it that everything happens according to the established rules." Similarly, Koutoupis and Malisiovas (2021) point out that "an adequate internal control system increases the profitability and financial performance of an institution."

Similarly, internal control has brought about changes that have favored transparency in accounting operations, which are the result of situations that have impacted society, such as the financial frauds in 2001 and 2002 that generated uncertainty in the financial markets of the United States, which led the US Congress to enact the Sarbanes Oxley Act in 2002, which sought to optimize corporate responsibility, improve financial disclosures to combat accounting fraud, and empower the Public Company Accounting Oversight Board (PCAOB) to provide comprehensive oversight of the auditing of these companies (Arwinge, 2013), thus forcing organizations in that sector to implement internal control mechanisms that would encourage the proper presentation of financial reports.

In contrast, companies in Mexico's financial markets are not subject to a regulation that requires such rigidity in applying, evaluating, and reporting the effectiveness of an internal control system, which

increases uncertainty among stakeholders about the optimal management of resources and integrity of accounting reports. Given this problem, this study considered measuring the perception of the degree of implementation of internal control in Mexico through a Likert scale survey. The questionnaire is in the Appendix of this document.

The survey instrument defined was designed based on the COSO 2013 Internal Control model of the Committee of Sponsoring Organizations of the Treadway Commission or COSO Organization. This decision was made considering that the two versions of the Internal Control model of this organization (1992 and 2013) have been the most popular in business management and that 2013 is the most recent. The same references have been confirmed by Buzo (2014), who indicated that "although the United States regulations do not require COSO as an application model, the Securities and Exchange Commission (SEC) and the PCAOB recognized the 1992 version as the most significant for companies in the stock exchanges of that country." Hirt, (2015), former president of the COSO Organization, also stated that "COSO 2013 has been the most eminent model for compliance with the Sarbanes Oxley Act in the United States."

Considering the references mentioned above, the main objective of this study is to determine whether there is a positive relation between the perception of internal control, operating efficiency, and profitability in Mexican public companies, establishing a hypothesis that the perception of internal control has an impact on operating efficiency and therefore on the profitability of Mexican public companies.

Financial information for the operating efficiency and profitability variables, as well as for the control variables company size (total assets), growth (net sales growth), and debt turnover (total liabilities), and the exogenous variable share price change, were obtained from the Bloomberg platform.

The hypothesis was tested by applying a quantile regression model to determine whether the operating efficiency (mediating variable) and return (dependent variable) of Mexican public companies are related to the perception of internal control (independent variable).

Return on Equity (ROE) was selected to analyze profitability as a dependent variable because it reflects investors' returns regarding each entity's net profits.

Regarding the mediating variable operating efficiency, the Total Asset Turnover indicator (ROT_ACti) was selected because of its ability to reflect the frequency with which the companies' assets are converted into net sales.

The "size" of the companies was considered a control variable due to its relation with the assets that the companies possess to operate. It measures their size and how they operate, as Llerena (2019) indicated when specifying that "the assets are the means of production whose operability generates benefits for the investors or capitalist partners so that the economic activity can be sustained."

Regarding the "growth" of the organizations, this was determined as a control variable, considering that sales and their increase are essential for organizations to increase their profitability and

preserve their value. This is confirmed by Pérez and Rodríguez (1998) when they point out that "the interannual rate of variation of variables expressive of the economic dimension of the companies measures the growth of companies."

Subsequently, the "indebtedness" of companies was also considered as a control variable because it is used as part of the efforts to grow and maintain business competitiveness. This is confirmed by Sauza et al. (2021) when they point out that it refers to "the obligations or commitments that organizations establish, determining the amount to be paid for each one of them."

Finally, "change in share price" was incorporated as an exogenous variable since it is closely related to the performance of the companies, as Rodriguez (2011) pointed out, specifying "that there is a relation between investment, debt and growth that define the economic and financial situation of a company" and that there are other external factors that could affect the financial situation.

The article is divided into 8 sections, including the introduction, a review of the state of internal control in Mexico, the background of operating efficiency and profitability, and an explanation of the study variables and the model applied, followed by the results, conclusions, references, and a section of appendices.

Internal control, status in Mexican public companies, and its measurement

Internal control originated in ancient times, being present in the first commercial interactions of humankind. Its objective has always been to carry out appropriate management of resources. Torres (2011) provides a relevant reference, stating that "in antiquity, there was a document that can be classified as the first book of Administration, promulgated in 1760 BC by King Hammurabi, of the first dynasty of Babylon, which contained the procedures to organize the production and distribution systems of the kingdom."

Consequently, internal control has also been the basis of administrative management for the fulfillment of business objectives, and companies that still do not comply with its fundamental principles must prioritize its application according to Jones and George (2010), who stated that the "efficiency in achieving organizational goals is obtained through the regulation of operations and control has been involved in this."

In connection with the above, the existence of internal control is linked to business risks, which, as pointed out by the Mexican Institute of Public Accountants (2013), "are threats from conditions, facts, circumstances, actions or omissions that could negatively affect the ability to achieve objectives and execute strategies or stem from the establishment of inadequate objectives and strategies."

Thus, it may be stated that business risks are inherent to the operation and organizations. The application of internal control systems could lessen the possibility that these materialize, as established by McNally and Tophoff (2014), who state that:

Organizations face various uncertain internal and external factors when working to achieve their objectives. The effect of this uncertainty on the organization's objectives is called risk, which can be positive, representing an opportunity, or negative, which could be a threat. For example, the safest place for a ship is its port, but that is not what ships are made for; they are made to transport people and goods to other places, and that implies a risk. The same concept is valid for organizations; risk should always be evaluated in the light of establishing and achieving your organization's objectives. If there are no objectives, there is no risk.

Consequently, the operation of internal control could be violated or interrupted by the human factor, negligence, control deficiencies, or provoked errors. Therefore, the establishment of control measures linked to the measurement of compliance could be helpful, as pointed out by Ayagre et al. (2014), who stated that:

For an internal control system to be effective and provide the necessary assurance to the Board of Directors, there must be some agents to measure its effectiveness since internal control is a process, but its effectiveness is a state or a condition in the process. Therefore, it is up to the Management and the Board to evaluate the effectiveness of the internal control system periodically.

Internal control has also been debated with regard to its benefits for transparency in financial statements. Although no control system guarantees the elimination of risk, it has been proven that its application favors the proper presentation of results, as confirmed by Boulhaga et al. (2022) in their study on the effects of the quality of internal control on the proper presentation of financial results, which determined that a good internal control system reduces the risk of manipulation of financial statements and, therefore, improves their reliability.

In addition, there could be differences in the degree of control measures established from one organization to another, where depending on their size, risk appetite, and available resources, they will decide the magnitude of the internal control measures that will be established, as indicated by Argüelles et al. (2013), who stated that:

Usually, the entrepreneur at the head of the SME is unaware of the need to have supervised controls that allow them to anticipate problems. It is commonly observed that managers are caught in situations that could have been anticipated with an adequate internal control system.

Although there is a belief that internal control is only viable for large companies, it has been determined that its application is not limited to the size of the organization or regulatory requirements and should be related to the benefits expected to be obtained, as stated by Frazer, (2016), in a study on the

benefits of internal control in small companies, which concludes that "although small companies face challenges to implement internal control systems due to various limitations such as costs, limited human resources, and other restrictions, this does not mean that its application is impossible or that better results cannot be obtained."

The type of sector also does not limit the application of internal control, and it has been concluded that its absence does not benefit financial results, as determined by Asiligwa and Rennox (2017) when analyzing the effects of applying or not applying internal control in commercial banking, corroborating that "its absence harmed the financial results of that sector."

Likewise, to correctly apply an internal control system, companies must establish a frame of reference that facilitates efficient resource management; on this subject, the Superior Audit Office of the Federation (2014) indicates that "applying an internal control system provides elements that promote the achievement of objectives, minimize risks and reduce the probability of acts of corruption and fraud."

Regarding the background of internal control in Mexico, the auditing regulations and procedures issued by the Mexican Institute of Public Accountants, when they were in force, established in bulletin 3050 the aspects to be considered for the study and evaluation of internal control as a basis for the financial auditing process. Currently, the Committee on Auditing Regulations and Procedures of the Mexican Institute of Public Accountants, within the International Regulation on Auditing 315 (2013), "specifies the procedures to be performed by the auditor to identify and assess the risks of material misstatement by understanding the entity and its environment, explaining that Internal Control helps the auditor to potentially identify what type of material misstatements may occur in the financial information, as well as to plan the nature, timing, and extent of additional audit procedures."

Likewise, as indicated, in Mexico there is no specific regulation requiring listed companies to disclose their internal control model and the degree of application thereof, the closest to this being the General Provisions Applicable to Securities Issuers and Other Securities Market Participants issued by the Ministry of the Interior (2019), which establish in its article 41 "the obligation to report the modifications made to the internal control and internal audit guidelines of the company and of the legal entities they control, as well as to the accounting policies and criteria, according to which they prepared their financial statements." It is important to clarify that this requirement does not require disclosure of the applied internal control model and the implementation level.

Concerning audit management for financial purposes, evaluations of the internal control environment are performed to determine the confidence in the scope of its reviews, as described by the Auditing and Assurance Standards Board (2009), which stated that "the validation of Internal Control is a step prior to audits to assess the risk of material misstatement in the Financial Statements." It should be

noted that this process in Mexico does not produce a formal report indicating the status of the internal control system.

Although it would not affect this research, in the case of Mexico those mentioned above in the previous paragraph are limited only to companies listed on the Mexican Stock Exchange. In this respect, Hernández (2019) confirmed that "the only companies that are required to be audited for financial purposes are those listed on the Mexican Stock Exchange following Article 85 Section III and Article 87 Section I of the Stock Market Law."

Therefore, considering that there are no data to determine the application of internal control by the companies only listed in Mexico and the relevance of its application in the business environment, the application of a Likert-type survey was justified to measure the level of perception of internal control in Mexican public companies, based on the COSO 2013 internal control model.

Operational efficiency and profitability

This section analyzes operational efficiency, which is related to the optimal use of resources to achieve productivity and improve financial performance, with internal control being a key factor in achieving the effective use of these. As Griffin (2011) indicates, "control helps ensure the effectiveness and efficiency necessary for successful management, indicating that it regulates organizational activities so that the elements of performance remain within acceptable limits."

Although some companies consider internal control as spending with a slow return on investment, its application has been shown to benefit the financial results of organizations that implement it, as concluded by Ibrahim et al. (2017), "who confirmed in their study on the impact of internal control on the results of healthcare institutions that there was a positive relation between internal control and financial returns."

Thus, it is also essential to establish surveillance measures in the operations in an internal control system, thus enabling the identification of areas for improvement and actions for the fulfillment of business objectives, as Lessambo (2018) points out, when stating that "efficiency indicators, measure how companies use their assets to generate profits. The most common are accounts receivable turnover, working capital, asset turnover, inventory turnover, and inventory days."

Likewise, it has been shown that the timely application of resources and the availability of qualified personnel for the implementation of internal control favor its link with financial performance, as analyzed by Nyakundi et al. (2014) when they determined that "although internal control strongly influences financial performance, companies still face challenges such as the lack of trained personnel and the timely application of financial resources for its implementation."

From the perspective of accounting standards, the Mexican Financial Reporting Standards Board (2021), in NIF-A-3, stresses "the importance of operating efficiency, indicating that it enables users of the information to evaluate the levels of production or return on resources generated by the assets used by the entity and establishes as indicators those related to inventory turnover and age, accounts receivable, net working capital, productive assets, and total assets."

Based on the above, it is established that operating efficiency is a crucial link between internal control and profitability since productivity and efficient use of assets will lead to improved financial results, measuring this variable through the Total Assets Turnover (ROT_ACti; Spanish, Rotación de Activos Totales) indicator.

In terms of profitability, the current economic context and the incorporation of digital environments have imposed challenges on organizations, driving them to seek improvement in financial performance, which in the social sphere is of relevance since companies support the creation of jobs, generate resources for the government, and are a source of prosperity in nations, so their objectives should focus on the search for favorable results that provide confidence to all those involved.

Likewise, profitability is a crucial element in the management of business resources, and the mechanisms for measuring financial performance are essential to ensure favorable results, as indicated by Paiva (2013), who states that "profitability is inherent to all economic action since it mobilizes human and financial means and material to obtain results."

On the other hand, the measurement of profitability enables the analysis of the performance of companies and helps in the constant search for improvement. Fontalvo et al. (2012) stated that "profitability indicators, also known as returns indicators, measure the effectiveness of the company's management in controlling costs and expenditures to convert sales into profits."

Moreover, considering that the generation of results is the main business objective of for-profit organizations, and this is measured through the profitability that is generated, the Mexican Financial Reporting Standards Board (2021) states that "profitability is linked to the entity's ability to generate profits or increase its net assets, defining in NIF A-3 as profitability indicators the various profit margins, sales growth, marginal contribution, and returns on investment and capital."

Finally, for this research Return on Equity (ROE) was used as an indicator of profitability since it reveals the company's capacity to generate profits with the capital, which confirms its relevance for the study.

Methodology

This section describes the activities and methods applied to carry out this work, which at a general level includes the analysis of the effects on the profitability of Mexican public companies due to the Operational Efficiency achieved by the adequate perception of Internal Control.

To begin with, the determination of the study population is explained, which includes the national companies listed on the Mexican Stock Exchange, excluding those in the financial sector and those that are also listed on the US financial markets, resulting in 103 companies, as detailed in Table 1:

Table 1
Analysis of the universe and study population

Universe (companies in the BMV stock market as of June 2020) (Spanish: Bolsa Mexicana de Valores)	147
Subtracting financial companies	-25
Non-financial companies	122
Subtracting foreign companies	-6
Study population	116
Companies in the US financial markets	13
Companies listed only on the BMV	103

Source: created by the authors

The study period covered from July 2010 to June 2020, gathering financial information on profitability indicators, operating efficiency, and control indicators such as company size, growth, debt turnover, and change in share price; the financial data were obtained through the Bloomberg platform.

To obtain information on the implementation of the COSO 2013 internal control model in the study population, since there are no published data on the companies that implement it, a survey on the perception of internal control based on Likert scales was conducted, based on the 5 components and 17 principles of COSO 2013. This is a reference framework in business management worldwide, as stated by the SEC (2013): "This model has satisfied its criteria and can be used for the annual evaluation of internal control and disclosure requirements," clarifying that the final rules of the SEC do not require the use of a particular framework.

The Likert instrument was a 5-level questionnaire, including 53 items and 3 questions that were applied to a sample of 46 companies, according to the formula suggested by Aguilar (2005), "for cases that correspond to a finite population and in which the variable is qualitative" and this is described below:

$$n = \frac{N * \mathrm{z}^2 \frac{\alpha}{2} * \ p * q}{E^2(\ N - 1) + * \mathrm{z}^2 \frac{\alpha}{2} * \ p * q}$$

Sample size determination:

Where:

n = sample size sought

N= Population size

z = statistical parameter that depends on the Confidence Level

E= maximum acceptable estimation error

p= probability of occurrence of the studied event (success)

q = (1-p) = Probability of the event not occurring

$$n = \frac{(103)\big(1.96)^2(0.5)(0.5)\big)}{(0.05)^2(103 - 1) + (1.96)^2(0.5)(0.5)} = 45.46$$

In order to determine the reliability of the Likert survey, the methodology of Cronbach's Alpha Coefficient was applied, as Spooren and Denekens (2007) suggest "validating the reliability of this type of instrument through this coefficient, revealing that a value higher than 0.70 indicates a reliable scale."

In this context, 5 constructs composed of the 5 components of the COSO 2013 Internal Control Framework were defined. The process was measured by conducting a pilot test with 17 experts, where it was specified that Cronbach's Alpha of the 5 evaluated constructs exceeded 0.70, thus confirming the reliability of the survey. The results are presented in Table 2:

Table 2
Determination of the reliability of the Likert Scale survey instrument

Constructs	Items:	Cronbach's Alpha (CA)	CA with typified elements
1.-Control Environment	18	0.883	0.892
2.-Risk Assessment	12	0.949	0.951
3.-Control Activities	10	0.915	0.918
4.-Information and Communication	8	0.862	0.865
5.-Supervision Activities	5	0.881	0.880
Total Items	53		

Source: created by the authors using SPSS

Before the survey launch, it was defined that the mean value of the responses of each survey >=4 corresponded to an adequate perception of internal control, and mean values lower than this metric

reflected the incomplete application of the model, considering this measurement as dichotomous, with 1 being adequate and 0 non-optimal.

Subsequently, the personnel who were candidates to answer the survey in the 103 companies of the study population were investigated using the LinkedIn social network. This process included personnel from the Audit and Accounting areas at the levels of Supervisors, Managers, and Directors, where all the contacts of the population were formally requested to fill out the instrument, thus increasing the response margin and approaching the sample of 46, with replies being received from 27, i.e., 59% of the sample. The sectors of the companies analyzed are described in Table 3:

Table 3
Matrix of the study population and analyzed sample

Sector	Total	% of Total	Only listed on the BMV	In the SEC	Completed Survey	% covered in the study
Industrial	37	32%	32	5	6	19%
Materials	22	19%	20	2	7	35%
Frequently used products	21	18%	18	3	5	28%
Non-core consumer goods services	20	17%	20	-	6	30%
Telecommunications services	9	8%	7	2	2	29%
Health	4	3%	4	-	1	25%
Energy	2	2%	1	1	-	-%
Information technology	1	1%	1	-	-	-%
	116		103	13	27	26%

Source: created by the authors

The quantile regression model was used because it does not require restrictive distribution assumptions, such as homoscedasticity, non-correlation, and normality of model errors. In the words of Soto (2023), "quantile regression is an extension of linear regression, which is used when the assumptions of linear regression are not met, i.e., linearity, homoscedasticity, independence or normality in the errors."

Additionally, due to the nature of the data, it was considered feasible to apply the quantile regression model, measuring the relation between the variables Y and Z and, in turn, the relation of Z with X; this includes the analysis of the square of the quantile regression coefficient "r2" to determine the variation of Y with the rest of the variables. As indicated by Aguilar et al. (2011), "the square of the multiple linear correlation coefficient r2 is the percentage of the variation of Y."

On the other hand, it was analyzed whether there is a mediating or moderating effect between the internal control perception variable, the mediating variable operating efficiency, and the dependent variable profitability. Theoretical studies have indicated that applying the COSO 2013 Internal Control

Framework could favor efficiency in operations and thereby improve financial performance. This was also confirmed in the analysis carried out (appendices section).

In order to lay the foundations of the analysis to determine the mediating effect, the definition by Nitzl et al. (2016) is followed, according to which this effect occurs "when a third variable plays an intermediate role between a dependent and an independent variable." Likewise, it is crucial to understand the moderating effect determined by Baron and Kenny (1986), who indicate that this occurs when "a qualitative or quantitative moderating variable affects the relation or strength of the relation between the independent and dependent variables."

The Return on Equity (ROE) indicator was used to evaluate the profitability variable, and for the operating efficiency variable, the Rotation of Total Assets (ROT_ACti) indicator was used. As control variables, company size (total assets), growth (increase in net sales), debt turnover (total liabilities), and change in share price were integrated as exogenous control variables. The information corresponded to July 2010 to June 2020 data and was extracted from the Bloomberg platform.

The hypothesis proposed is: The perception of internal control has an impact on the operating efficiency and, therefore, on the profitability of Mexican public companies, and the estimated model to test it is:

$$\mathbf{ROE}_{it} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 \text{Tamaño}_{it} + \boldsymbol{\beta}_2 \text{Rot\_Deuda}_{it} + \boldsymbol{\beta}_3 \text{Crec}_{it} + \boldsymbol{\beta}_4 \text{Merc}_{it} + \boldsymbol{\beta}_5 \text{EO\_Rot\_Act}_{it} + \boldsymbol{\beta}_6 \text{PC\_COSO13}_{it} + \boldsymbol{e}_{it}$$

Where:

ROEit= Return on equity, net income divided by the shareholders' equity of company i for the period t.

EO_Rot_Actit=Total assets turnover corresponds to net sales divided by total assets of company i in period t.

PC_COSO13it=Perception of the degree of application of Internal Control, dichotomous variable, which takes the value of 1 if the mean of the values of the Likert Scale internal control perception survey of company i in period t has a value >=4 and 0 otherwise.

Tamañoit= Value of Total Assets, the natural logarithm of company i's assets in period t.

Rot_Deudait=Rotation of Total Liabilities, natural logarithm of the quarterly rate of change of total liabilities of company i of period t compared to period t-1.

Crecit=Total Revenue Value, natural logarithm of the quarterly rate of change of company i's sales in period t compared to period t-1.

Mercit=Change in share price, natural logarithm of the quarterly rate of change of company i's share price in period t compared to period t-1.

Results

Although for the quantile regression model it is not necessary to specify the multicollinearity of the variables, the Pearson correlation matrix was calculated to determine the strength of the relation between the variables (Lind et al., 2012), observing weak positive and negative correlation indices in the independent and mediating variables, as well as in the values shown by the control variable (Table 4).

Table 4
Correlation coefficients of the variables

	EO_ROT_ACTIT	PC_COSO13	TAMANOIT	ROT_DEUDAIT	CRECIT	MERCIT
EO_ROT_ACTIT	1.000					
PC_COSO13	0.125	1.000				
TAMANOIT	-0.083	-0.121	1.000			
ROT_DEUDAIT	-0.008	-0.062	0.056	1.000		
CRECIT	0.048	-0.006	0.014	0.129	1.000	
MERCIT	0.098	-0.006	0.022	-0.046	0.108	1.000

Source: created by the authors using E-views

Table 5 shows the results of the descriptive statistics of the variables, indicating that the means and medians are different and also that the level of skewness is not equal to 0 in all the variables, which means that they are not asymmetrically distributed, indicating that 3 of the control variables, size, growth, and change in the share price, are asymmetrically negative. The rest of the variables have positive skewness.

Additionally, the level of kurtosis in 6 of the 7 variables, including the dependent variable, is higher than 3 except for the internal control perception, which means that the sample includes extreme or leptokurtic values. It was also specified that an average of 44.2% of the companies surveyed have an adequate perception of internal control according to COSO 2013 principles, while the maximum value of this variable was 100% and the minimum 0%. On the other hand, the return on assets representing the operating efficiency variable presented an average turnover of 88.4%, a maximum of 281.4%, and a minimum of 80.4%. Regarding the P value, 0 is shown in all variables, indicating normality.

Table 5
Descriptive statistics

Statistic	ROEIT	EO_ROT_ACTIT	PC_COSO13	TAMANOIT	ROT_DEUDAIT	CRECIT	MERCIT
Mean	7.507	0.884	0.442	9.937	0.030	0.005	-0.06
Median	6.645	0.804	0.000	10.325	0.012	0.015	0.000
Maximum	107.883	2.814	1.000	12.964	1.031	1.539	0.716
Minimum	-48.218	0.080	0.000	0.000	-1.015	-1.686	-0.836
Stad. Dev.	9.948	0.474	0.497	2.084	0.115	0.188	0.157
Skewness	1.242	1.412	0.232	-2.486	1.722	-1.427	-0.527
Kurtosis	18.858	6.027	1.054	12.315	24.712	28.012	7.438
Jarque-Bera	9587.097	637.752	148.942	4148.473	17981.160	23580.340	774.167
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: created by the authors using E-views

On the other hand, Table 6 shows the differences between the regression coefficients of the 3 defined quantiles (0.25, 0.50, and 0.75), with the finding that the effect in Mexico, which is an emerging country, was significant in the 3 company sizes, but with a negative impact. A possible explanation for this is that the respondents had a perception of internal control from the perspective of the initial cost of its application, presenting a negative impact on the ROE.

In addition, it is noteworthy that in all company sizes, the change in MERCit share price was significant; a possible explanation for this lies in the stakeholders' perception of the application of internal control in institutional or publicly traded companies, associating it with greater transparency, efficiency, and reliability, which translates into higher profit generation.

Another important finding is the significance observed in smaller and medium-sized companies regarding the TAMANOit variable, which could be explained by the greater maturity of large companies, reducing the relevance of the effect in this segment.

Likewise, it is observed that the effect of ROT_DEUDAit was significant only in companies with higher ROE, with a negative coefficient in all quantiles, which is consistent with the understanding that indebtedness does not favor the profitability of companies due to the financing costs it generates and the fact that larger companies have a better capacity to cover their debts.

Finally, it is observed that the growth of CRECit sales was only significant in medium and large-sized companies. This finding can be explained by the differences in the capacity to generate income between companies of different sizes; medium and large companies generally have greater resources and capacity to generate revenue, which enables them to take better advantage of growth opportunities.

Table 6
Model X_2 internal control perception

$$ROE_{it} = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 Tamaño_{it} + \boldsymbol{\beta}_2 Rot\_Deuda_{it} + \boldsymbol{\beta}_3 Crec_{it} + \boldsymbol{\beta}_4 Merc_{it} + \boldsymbol{\beta}_5 EO\_Rot\_Act_{it} + \boldsymbol{\beta}_6 PC\_COSO13_{it} + e_{it}$$

Variable	Quantile 0.25		Quantile 0.50		Quantile 0.75	
C	-5.972 ***	(-5.15)	-3.111 ***	(-2.873)	4.512	(1.085)
MERCTI	4.174 ***	(3.592)	2.097 *	(1.956)	4.009 **	(1.985)
TAMANOIT	0.907 ***	(7.314)	0.735 ***	(6.423)	0.321	(0.989)
ROT_DEUDAIT	-1.374	(-0.563)	-2.941	(-1.437)	-5.906 ***	(-2.752)
CRECIT	1.265	(1.386)	2.026 **	(2.305)	3.255 ***	(2.7)
EO_ROT_ACTIT	1.700 ***	(3.602)	3.037 ***	(5.083)	4.745 ***	(4.109)
PC_COSO13	-1.084 **	(-2.486)	-1.074 ***	(-2.77)	-2.010 **	(-2.571)

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5% and *Significance level at 10%

In order to strengthen the hypothesis, an analysis of the period before and after the implementation of COSO 2013 (December 2014) was also performed, observing that the impact of the operating efficiency variable is reduced after the applicability period. An explanation for this reduction

could be an initial cost that internal control managers assumed after implementing the COSO 2013 Framework, such as investment in training and software (tables 7 and 8).

On the other hand, the analysis prior to the applicability of COSO 2013 (December 2014) shows that Operating Efficiency was significant only in the first 2 levels of companies and that in all cases, the coefficients were positive to ROE (table 7). A probable reason for this would be the importance that could be attached to internal control by medium and smaller companies, and in the case of large companies, the influence of other variables could dilute this effect.

Table 7
Operational efficiency model before COSO 2013 implementation

$$ROE_{it} = \beta_0 + \beta_1 Tamaño_{it} + \beta_2 Rot\_Deuda_{it} + \beta_3 Crec_{it} + \beta_4 Merc_{it} + \beta_5 EO\_Rot\_Act_{it} + \beta_6 PC\_COSO13_{it} + e_{it}$$

Prior to the implementation of COSO 2013 (from July 2010 to December 2014)						
Variable	Quantile 0.25 (before)		Quantile 0.50		Quantile 0.75	
C	-2.983	(-0.921)	3.211	(1)	12.387 *	(1.943)
MERCIT	0.954	(0.375)	1.928	(0.777)	2.634	(0.444)
TAMANOIT	0.533	(1.52)	0.009	(0.03)	-0.383	(-0.976)
ROT_DEUDAIT	-2.231	(-0.709)	-3.665	(-1.192)	-6.264 **	(-2.096)
CRECIT	1.536	(0.374)	-2.574	(-0.874)	-0.219	(-0.036)
EO_ROT_ACTIT	3.547 ***	(3.757)	5.535 ***	(9.51)	5.095	(1.642)

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5% and *Significance level at 10%

In contrast, after the mandatory application of COSO 2013 (January 2015), such coefficients were significant except in smaller companies, which is reasonable since small organizations tend to focus their resources on other priority areas and the implementation of a change such as COSO 2013 may not be one of them; this can be seen in Table 8.

Table 8
Operational efficiency model after COSO 2013 implementation

$$ROE_{it} = \beta_0 + \beta_1 Tamaño_{it} + \beta_2 Rot\_Deuda_{it} + \beta_3 Crec_{it} + \beta_4 Merc_{it} + \beta_5 EO\_Rot\_Act_{it} + \beta_6 PC\_COSO13_{it} + e_{it}$$

After the implementation of COSO 2013 (from January 2015 to June 2020)						
Variable	Quantile 0.25 (before)		Quantile 0.50		Quantile 0.75	
C	-5.986 ***	(-5.618)	-3.123 ***	(-3.187)	-1.763	(-0.772)
MERCIT	4.143 ***	(2.584)	2.412 **	(2.119)	4.121 **	(2.232)
TAMANOIT	0.953 ***	(9.574)	0.760 ***	(7.532)	0.824 ***	(4.544)
ROT_DEUDAIT	-4.594	(-0.838)	-1.146	(-0.452)	-6.027 *	(-1.864)
CRECIT	2.173 ***	(2.806)	2.213**	(2.448)	4.031 ***	(3.767)
EO_ROT_ACTIT	-0.494	(-0.891)	1.062*	(1.928)	2.915 **	(1.978)

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5%, and *Significance level at 10%.

Conclusions

As observed in this research, the COSO 2013 Internal Control Framework has been established as a reliable option that organizations can use to apply internal control and thus order operations and efficiently use resources to meet profitability objectives.

The research was conducted to determine the perception of internal control in companies listed on the stock market of the Mexican Stock Exchange and also not listed in the United States, given the fact that there is no formal indicator of this variable, considering that its application causes efficiency in operations and the connection of this with financial performance.

The procedures applied to test H_1 included confirmation of the application of the COSO 2013 Internal Control Framework through a Likert survey conducted using the Forms tool and the LinkedIn social network to contact people. In addition, financial data published on the Bloomberg platform were obtained and after the information was processed, the quantile regression method was applied.

In the analysis carried out, the hypothesis that the perception of Internal Control has an impact on the efficiency of operations and consequently on the profitability of Mexican public companies was proven, observing that the application of internal control implies operating costs, so the risks and cost-benefit of applying it must be evaluated. This is based on the results of the statistical models studied, observing a favorable level of significance in the 3 quantiles of the variables Perception of Internal Control and Operational Efficiency, with a negative effect in the regression coefficients of the variable Perception of Internal Control. A possible reason for this is that companies have interpreted the implementation of COSO 2013 as a cost as it is not a regulatory requirement.

It should be noted that the results presented in both cases coincide with those of the studies by Ibrahim et al. (2017), Ndiaye et al. (2019), and Koutoupis and Malisiovas (2021), that in a general context, when applying internal control, it should be considered that the implementation costs affect the profitability of companies at the beginning and that in the long run, they will become an initial investment. A reason for this is indicated by Ge et al. (2017), who explain "that the application of internal control for compliance with the Sarbanes Oxley Act includes implementing an internal control system for financial reporting, which involves the cost of monitoring by the external auditor, as well as the application of resources in the evaluations required of management."

The initial implementation cost of internal control is an impact factor, and this was also confirmed when analyzing the effects of COSO 2013 implementation on operating efficiency and profitability, finding that the ratios were reduced, which could be because the internal control managers who completed the survey observed a cost at the beginning associated with the implementation of COSO 2013.

As additional contributions, it is worth mentioning that the perception of internal control in Mexican companies only listed on the Mexican Stock Exchange is favorable in 67% (18 out of 27 companies) of the cases analyzed through the Likert survey instrument. Likewise, the complete mediating effect between Internal Control, Operational Efficiency, and Profitability was substantiated, confirming the above hypothesis.

Finally, to optimize internal control practices, the study models analyzed in this research propose the following:

- Implement an appropriate risk assessment to identify areas where controls should be implemented or strengthened.
- Conduct a cost-benefit analysis to determine the feasibility of implementing or improving new controls.
- Prioritize investment in controls in the areas of greatest risk and that have the greatest impact on the efficiency of operations.
- Mexican regulations could also be strengthened to guarantee the application of internal control in all institutions.

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Annex

Survey to measure the perception of internal control

Item:	Totally disagree (1)	Mostly disagree (2)	Neither agree nor disagree (3)	Mostly agree (4)	Totally agree (5)
Points: 1 .-Commitment to integrity and ethical values.					
1) Do you consider that the organization is committed to ethical values through all its actions?					
2) Does communicating the code of conduct to staff and business partners ensure they are aware of it?					
3) Is the evaluation of personnel's compliance with the regulations of conduct adequately carried out?					
4) Are deviations from conduct regulations not identified and effectively addressed?					
Points: 2.-Independence of the Board of Directors from Management.					
5) Does the Board of Directors effectively exercise management oversight?					
6) Do you consider that the members of the Board of Directors have the necessary skills to supervise the Management adequately?					
7) In your organization, does the Board of Directors show no independence regarding the activities of the Administration (General Management and their team)?					

Item:	Totally disagree (1)	Mostly disagree (2)	Neither agree nor disagree (3)	Mostly agree (4)	Totally agree (5)
8) Does the Board of Directors monitor the implementation and execution of internal control adequately?					
Points: 3. Management of business objectives.					
9) Does achieving the company's objectives consider all legal entities and business units?					
10) Are the levels of authority and responsibilities of the entity's personnel not adequately established?					
Points: 4. Attraction, development, and retention of personnel.					
11) Are personnel competencies appropriately defined to meet business objectives?					
12) Are personnel competencies periodically evaluated to resolve deviations promptly?					
13) Does the organization lack effective mechanisms for attracting and developing appropriate personnel to meet business objectives?					
14)Does the organization have staff succession plans that enable continuity of operations?					
Points: 5. Staff Responsibilities.					
15) Does the definition of staff responsibilities ensure effective accountability?					
16) Are the parameters for measuring performance and awarding incentives not aligned with business objectives?					
17) Are the pressures associated with achieving objectives adequately assessed and adjusted?					
18) Are rewards or disciplinary measures applied to personnel due to performance evaluations, compliance with behavioral regulations, and competencies?					
Points: 6. Definition of business objectives to identify and evaluate risks.					
19) Do you consider that the business objectives (operational, information, and regulatory compliance) do not adequately fulfill the actions chosen by the company?					
20) Is the materiality threshold of the business objectives and the risk at each location where the company carries out activities appropriately defined?					
21)Does the company consider operational objectives when allocating resources to achieve the desired operational and financial performance?					
22) Does the information processed in all areas present the organization's actual data within acceptable limits?					
Points: 7. Identification of risks surrounding the fulfillment of the business objectives.					
23) Is the process of assessing and identifying business risks company-wide?					
24) Does identifying business risks not consider all internal and external factors, as well as the impact on achieving business objectives?					
25) Does the company adequately manage the organization's risks by applying controls to mitigate them?					

Item:	Totally disagree (1)	Mostly disagree (2)	Neither agree nor disagree (3)	Mostly agree (4)	Totally agree (5)
26) Are the identified risks analyzed by estimating the potential significance of the risk?					
Points: 8. Fraud risk assessment.					
27) Do you consider that the risk of fraud in the organization is evaluated considering the different fraud structures of the business model?					
28) Do you consider that the fraud risk assessment does not cover all exposed locations and operations?					
29) Does the organization's fraud risk assessment consider potential scenarios that could motivate personnel to commit irregular acts?					
Points: 9. Evaluation of changes affecting the internal control system.					
30) Do you consider the company's mechanisms to identify and act upon risks due to changes in operating conditions that could affect the achievement of the company's objectives to be adequate?					
Points: 10. Establishment of controls to mitigate business risks.					
31) Do the controls in your organization favor the operation, adequately managing business risks?					
32) Do you consider that the organization has not properly implemented controls in the processes that require it?					
33) Are responsibilities that are incompatible (e.g., selling a loan and approving it) distributed or, if applicable, managed with control tasks in such a way that					
Points: 11. Definition of controls over the technology.					
34) Do you consider that automated and technological controls do not ensure the proper application of policies and procedures?					
35) Does the organization establish controls over the technological infrastructure that ensure the proper operation of the technological processes?					
36) Are the access restrictions to the users of the information systems adequate, considering the responsibilities of the personnel?					
37) Are the processes to acquire, develop, and maintain technology to meet the company's objectives properly managed?					
Points: 12. Operationalization and formalization of controls					
38) Do you consider that the policies and procedures are not connected with the actions followed by the personnel in your organization?					
39) Does the company establish responsibilities for the proper execution of internal control by personnel?					
40) Is the process for updating controls performed promptly (e.g., every 2 years or when applicable)?					
Points: 13. Processing of information for the operation of Internal Control.					
41) Do you consider that the internal control system's information generation process is not the most appropriate?					
42) Is the effectiveness of information systems for obtaining data from internal and external sources adequate in your organization?					

Item:	Totally disagree (1)	Mostly disagree (2)	Neither agree nor disagree (3)	Mostly agree (4)	Totally agree (5)
43) State the level of agreement regarding properly implementing information systems under business objectives.					
44) Do you consider that the personnel in your organization are not being informed promptly about the internal control responsibilities applicable to each position?					
45) Do the Management and the Board of Directors have the information they need to perform their duties properly?					
46) Does the complaint system ensure anonymous reporting of ethical lapses observed in the operation?					
Points: 15. Adequate communication with external stakeholders for the proper operation of internal control.					
47) Does the level of the company's communication with external entities (suppliers, customers, etcetera.) not guarantee compliance with the internal control system?					
48) Do you consider that the communication channels guarantee adequate interaction with clients, consumers, suppliers, external auditors, regulators,					
Points: 16. Establishment of continuous or independent evaluations of the internal control system.					
49) Do the extent and frequency of the evaluations performed by the company of the internal control system not guarantee its reasonable functioning?					
50) In your opinion, do the personnel performing the internal control system evaluations have adequate competencies to ensure the effectiveness of the internal control system?					
Points: 17. Communication of internal control deficiencies and implementation of corrective measures.					
51) Are the results of internal control evaluations communicated to management or the Board of Directors promptly for effective analysis?					
52) Is the communication process of Internal Control deficiencies adequately communicated to the Directors and Managers to ensure their remediation?					
53) In your opinion, is the process carried out by the Company's Directors to determine the remediation of Internal Control deficiencies effective?					
Describe the year your organization implemented the aspects of internal control identified in the survey.					
Mention the Internal Control Model used by your organization.					
Indicate the year your organization applied the internal control model indicated in the previous question.					

Source: created by the authors

Analysis of the moderating and mediating effects of the operating efficiency variable

This section presents the results of the mediating effect of the variable Z Operating Efficiency between the independent variable X and the dependent variable Y Profitability.

When analyzing the various bibliographic sources, it was found that some theoretical assumptions on operating efficiency indicated that the order exercised by internal control increases the efficiency of operations, which significantly affects profitability.

Cheng *et al*. (2018) specified that "an ineffective internal control system harms the operational efficiency of companies."

Baik *et al*. (2013) also noted that "profitability is determined by how efficiently companies use available resources to maximize their results. There must be a connection between profitability and efficiency."

As explained in the theoretical foundations of this study, the mediating effect occurs when an independent variable affects the dependent variable through another, as indicated by García and Vallejo (2011), who stated that:

Sometimes the causal effect of X on Y can be mediated by some variable (or process) Z. If this is inserted between X and Y, originating the causal chain X Z Y, the resulting model is called a simple mediation model, where Z plays the role of a mediating variable.

Thus, there could also be a complete or partial mediating effect. Ortiz (2016) stated that "mediating variables fully or partially transmit the effect that the predictor variable (X) has on the target variable (Y)."

On the other hand, Baron and Kenny (1986) pointed out the following:

The indirect effects of a variable, specifically the moderating effect, occur when a qualitative or quantitative variable affects the direction or strength of the relation between an independent and a dependent variable. In contrast, they indicated that the mediating effect explains how external physical events take on significance in internal physical events.

Additionally, the analysis of indirect effects, such as the mediator and moderator, involves evaluating the significance of the relations between the independent, mediating, or moderating variables and the independent one; this also entails a comparison with the direct effects. In this regard, Nitzl *et al*. (2016) suggest reviewing: "the indirect effect of the variables to prove that mediation exists, subsequently evaluating the strength of the mediating effect of the variables, and finally reviewing the significance level of the mediating effect."

To determine the indirect effect indicated in the hypothesis of this study, the steps established by Baron and Kenny (1986) will be carried out. They indicate the following:

Moderator: If the independent variable is described as "X," the moderator as "Z," and the dependent variable as "Y," the regression of Y on X, Z, and XZ should be performed, indicating that there will be a moderating effect if XZ is significant, as long as X and Z are controlled.

Mediator: To test this effect, the regression of X on Z should be performed, then of Z on Y, as well as the direct effect of X on Y. The mediating effect is determined if X is related to Z and Z is related to Y, according to the following variant: if X does not affect Y there is a complete mediating effect, and if it does affect Y there is a partial mediating effect.

The exercise is explained in tables A9, A10, and A11, which are shown below:

Table A9
Analysis to determine the existence of a moderating effect of Z

Relation between variables	Moderating effect	Significance of indirect effect	Result
X ROEIT= PC_COSO13*EO_ROT_ACTIT	-0.281	0.465	No moderating effect

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5% and *Significance level at 10%

Table A10
Analysis to determine the existence of a mediating effect of Z

Relation between variables	Indirect effect	Significance of indirect effect	Result
X PC_COSO13 $_a$ ZEO_ROT_ACTIT	0.070	0.031	*** Full indirect effect
ZEO_ROT_ACTIT $_a$ YROEIT	3.655	0.000	*** Full indirect effect
INDIRECT EFFECT X	0.255	0.000	*** Full indirect effect

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5% and *Significance level at 10%

Table A11
Analysis to determine the existence of a direct effect of X and Y

Relation between variables	Indirect effect	Significance of indirect effect	Result
X PC_COSO13 a YROEIT	-0.305	0.456	Full indirect effect

Source: created by the authors using E-views
Table notes: ***Significance level at 1%, **Significance level at 5% and *Significance level at 10%

The results presented in Table A9 indicate no moderating effect between XZY. In addition, the results presented in Tables A10 and A11 indicate that X shows a complete mediating effect, thus confirming the effect stated in the hypothesis of this study.